Calculations for Water Main Disinfection:

Given a 500 ft section of 8 inches water main, how much 65% Available Chlorine (HTH) is needed to provide an initial application of 50 mg/L?
(HTH = High Test Hypochlorite = Calcium Hypochlorite)

1. **Convert 8" to feet (ft) =(8 in / 12 in = 0.667 ft).**
   Diameter (d) = 0.667 ft.
   Radius (r) = 0.333 ft (½ of diameter)

2. **Find the volume (V) in cubic feet (ft^3)**
   Volume = area of cross section of pipe (A) x Length (L)
   V = A x L
   Area = ((pi) x the radius squared (r^2 = r times itself)
   A = (r^2
   It is given that (= 3.14
   V (ft^3) = 3.14 x (r^2) x Length or 3.14 x (0.333 x 0.333) x 500 = <u>174.1 ft^3</u>

3. **Find the amount of gallons of water in the line.**
   Conversion factor for water equals 7.48 gal per cubic feet (ft^3)
   Gallons equal Volume (ft^3) x Conversion Factor for Water [Gallons/ (ft^3)]
   Gallons = 174.1 ft^3 x 7.48 gallons/ (ft^3)
   Gallons = <u>1,302.2 gallons</u>

4. **Find lbs of 100% Available Chlorine**
   Available Chlorine is the actual chlorine available for disinfection
   lbs of 100% Available Chlorine = Volume x Dose x Density of Water
   Volume = Millions of Gallons (MG) = 1302.2 / 1,000,000 = 0.0013 MG
   Dose = the concentration of the disinfectant in the water (mg/L) = 50 mg/L
   Density of Water = 8.34 lbs/gallon
   lbs of 100% Available Chlorine = 0.0013 x 50 x 8.34 = <u>0.54 lbs</u>

5. **Find lbs of 65% Available Chlorine.**
   lbs of 65% Available Chlorine =
   lbs of 100% Available Chlorine/0.65 Available Chlorine
   lbs of 65% Available Chlorine = 0.54 lbs/ 0.65 Available Chlorine =
   <u>0.83 lbs of 65 % Available Chlorine</u>

6. **Find ounces of 65% Available Chlorine.**
   ounces of 65% Available Chlorine =
   lbs of 65% Available Chlorine x 16 oz/lb
   ounces of 65% Available Chlorine = 0.83 lbs x 16 oz/ lb = <u>13.3 oz</u>

The following information is for water flowing at a velocity of 2.5 ft/sec through the indicated water main diameter:

MAIN SIZE	GALLONS PER MINUTE
2"	24
4"	96
6"	220
8"	392
10"	612
12"	880

Example:

Given a 500 ft section of 8 in water main, what volume of water is equal to a flow velocity of 2.5 ft/sec?

1. **Convert 8" to feet =(8 in / 12 in = 0.667 ft).**
   Diameter (d) = 0.667 ft.
   Radius (r) = 0.333 ft (½ of diameter)

2. **Find: Volumetric Flow as cubic feet per second (ft^3/sec)**
   Volumetric Flow (ft^3/sec) =
   Velocity (ft/sec) x Cross Sectional Area (ft^2)
   Velocity = 2.5 ft/sec
   Given: (= 3.14
   Cross Sectional Area =
   (x r^2 = 3.14 x 0.333 x 0.333 = 0.348 ft^2
   Volumetric Flow = 2.5 x 0.348 = <u>0.87 ft^3/sec</u>

3. **Find Volumetric Flow as gal/sec:**
   Conversion factor for water equals =
   7.48 gal per cubic foot (ft^3)
   gal/sec = ft^3/sec x 7.48 gal/ft^3 =
   0.87 x 7.48 = <u>6.5 gal/sec</u>

4. **Find Volumetric Flow as gal/ min**
   gal/min = gal/sec x 60 sec/min =
   6.5 x 60 = <u>390 gal/min</u>

Disinfection With Clorox

This method utilizes a "relational factoring" type of equation to determine the volume of Clorox (b) needed to give an initial concentration of disinfectant (C) in a particular volume (V) of water. The equation is based on mixing 1 fluid ounce of Clorox in 1 gallon of water which yields an initial concentration of 410 mg/L per gallon or [(410 mg/L) (gallon)]. Clorox has a sodium hypochlorite (NaOCl) strength of about 5.25%.

If you know the volume of water to be treated and the desired initial concentration, then you may easily calculate the fluid ounces of Clorox required.

Example 1:

How many fluid ounces of Clorox must be added to 10,000 gallons of water to achieve an initial concentration of 410 mg/L?

$$b = 10{,}000 \text{ gallons} \times 410 \text{ mg/L} \times \frac{\text{fluid ounces}}{(410 \text{ mg/L})(\text{gallons})}$$

$$b = \underline{10{,}000 \text{ fluid ounces}}$$

OR 10,000 fluid ounces / 128 fluid ounces per gallon = 78 gallons

Example 2:

How many fluid ounces of Clorox must be added to 1,000 gallons of water to achieve an initial concentration of 50 mg/L?

$$b = 1{,}000 \text{ gallons} \times 50 \text{ mg/L} \times \frac{\text{fluid ounces}}{(410 \text{ mg/L})\ (\text{gallons})}$$

$$b = \underline{122 \text{ fluid ounces}}$$

OR 122 fluid ounces / 32 fluid ounces per quart = 3.8 quarts

It's as simple as that!